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QoS SCHEDULER AND METHOD FOR IMPLEMENTING QUALITY OF SERVICE ANTICIPATING THE END OF A CHAIN OF FLOWS

Field of the Invention

5 The present invention relates generally to the storage and data networking fields, and more particularly, relates to a QoS scheduler, scheduling method, and computer program product for implementing Quality-of-Service (QoS) scheduling with detecting and anticipating the end of a chain of flows.

Related Applications

10 Related United States patent applications by William John Goetzinger, Glen Howard Handlogten, James Francis Mikos, and David Alan Norgaard and assigned to the present assignee are being filed on the same day as the present patent application including:

15 United States patent application Serial Number 10/004,373, entitled "QoS SCHEDULER AND METHOD FOR IMPLEMENTING PEAK SERVICE DISTANCE USING NEXT PEAK SERVICE TIME VIOLATED INDICATION";

20 United States patent application Serial Number 10/002,416, entitled "QoS SCHEDULER AND METHOD FOR IMPLEMENTING QUALITY OF SERVICE WITH AGING TIME STAMPS";

United States patent application Serial Number 10,004,440,

ROC920010206US1

1000437.10101

entitled "QoS SCHEDULER AND METHOD FOR IMPLEMENTING
QUALITY OF SERVICE WITH CACHED STATUS ARRAY";

5 United States patent application Serial Number 10/016,518,
entitled "WEIGHTED FAIR QUEUE HAVING EXTENDED EFFECTIVE
RANGE";

United States patent application Serial Number 10/015,994,
entitled "WEIGHTED FAIR QUEUE SERVING PLURAL OUTPUT PORTS";

10 United States patent application Serial Number 10/015,760,
entitled "WEIGHTED FAIR QUEUE HAVING ADJUSTABLE SCALING
FACTOR"; and

United States patent application Serial Number 10/002,085,
entitled "EMPTY INDICATORS FOR WEIGHTED FAIR QUEUES".

Description of the Related Art

15 Storage and data networks are designed to support the integration of
high quality voice, video, and high speed data traffic. Storage and data
networking promises to provide transparent data sharing services at high
speeds. It is easy to see that rapid movement and sharing of diagrams,
pictures, movies, audio, and the like requires tremendous bandwidth.
20 Network management is concerned with the efficient management of every
bit of available bandwidth.

25 A need exists for a high speed scheduler for networking that ensures
the available bandwidth will not be wasted and that the available bandwidth
will be efficiently and fairly allocated. The scheduler should permit many
network traffic flows to be individually scheduled per their respective
negotiated Quality-of-Service (QoS) levels. This would give system
administrators the ability to efficiently tailor their gateways, switches, storage
area networks (SANs), and the like. Various QoS can be set up using
combinations of precise guaranteed bandwidth, required by video for
example, and limited or unlimited best effort bandwidth for still pictures,
30 diagrams, and the like. Selecting a small amount of guaranteed bandwidth